# Evaluation of a Computerized Nasogastric Tube Placement Simulator

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SmartHealth

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## Introduction

Nasogastric tube (NGT) placement is a common clinical procedure. However, the tube may be inadvertently misplaced, which can lead to complications or fatality.

To enhance NGT placement training, a computerized simulation system based on virtual reality (VR) technology was developed. It was equipped with a robotic interface to mimic real intubation and to allow users to perceive the computer-generated forces with their hand.

Compared to conventional mannequin-based training, the system simulated nasogastric anatomy and frictional forces, and was more interactive in that visual, audio and force feedbacks were provided. The virtual patient could gag or cough, and be instructed to swallow via verbal command. The aim of the study is to evaluate the usability of the simulator.

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## NGT Placement Simulator

## Methods

Nine nurses experienced in NGT placement were recruited. Individual sessions were arranged for each subject, where description of the VR simulator and demonstration of its operations was provided, followed by hands-on trials. The subjects were then asked to respond to a 7-point Likert questionnaire (1 = strongly disagree, 7 = strongly agree) containing 6 items on the clarity of the simulated procedures, realism of the graphics and insertion force, and the educational value. They were also invited to give open comments. The process was about 45 minutes for each subject.

## Results

| Items | Mean (95% CI) |
|---|---|
| Ability to present the procedure clearly | 5.78 (5.14-6.42) |
| Feasibility for use in nurse training | 5.44 (4.49-6.39) |
| Ability to better performance in reality | 5.22 (4.48-5.97) |
| Overall realism (i.e. graphics and forces) | 4.67 (4.15-5.18) |
| Feasibility to substitute the use of mannequin | 4.89 (3.71-6.07) |
| Total: | 5.11 (4.79-5.43) |

## Discussion

The simulator was apparently well-accepted by the subjects and had potential to supplement conventional training approaches. It was able to simulate the insertion forces and patient responses. The real-time interactions, unavailable in mannequin-based training, were helpful to enrich learning experience and enhance vigilance to patient conditions. The role of the simulated forces was to improve overall realism rather than serving as major cues for placement.

It was suggested to improve the system by including interactive verbal instructions and simulating more responses of patients. Moreover, NGT placement of neonates, unconscious or traumatized patients could be simulated to facilitate case-based learning.